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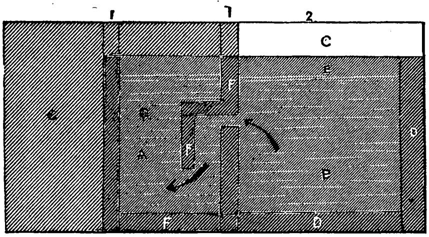
MICROSCOPY.

A NEW GROWING-CELL.— Having lately had occasion to examine some minute forms of life, and finding that, from some cause or other, most of the growing cells failed to work well continuously, I made a growing-cell similar to the following sketch, which I trust some readers will find useful.

Cut two pieces of moderately thick crown glass, one 3 inches by 1½ inches, the other 1¾ inches by 1½ inches, cement these together with Canada balsam; when dry, fix with the same cement two slips of glass of the same thickness to the other end of the slip, so as to form the sides of the reservoir (D D); also fix with gold-size slips of thin glass, so as to form the sides of the growing-cell (F F F F); when quite dry, cement a piece of thin glass 2¼ inches by 1¼ inches over all—care being taken that a very small quantity of gold-size is used, or it will run into the growing-cell. When used, fill the reservoir with fresh water until it runs into growing-cell A, and both are at the same level. The object (the growth of which it is desired to observe) may then be placed in the cell. If made of these dimensions, the water in the reservoir B will continue to supply fresh water to the growing-cell for at least three days without being refilled; of course, if the reservoir is made larger, it will last longer than this.

Fig. 174.



References to illustration: A, growing-cell; B, reservoir fresh water; C, glass slip 3 inches by 1½ inches; D, side of reservoir; E, thin glass 2¼ inches by 1¼ inches; F, sides of growing-cell; G, growing object.—JNO. H. MARTIN, *Micro. Assay Laboratory, Maidstone, England.*

REVIVAL OF ANIMALCULES AFTER DESICCATION.— Mr. Henry Davis discusses this old and curious question in a recent contribution to the Royal Microscopical Society. He finds that Pritchard and Carpenter and nearly all modern scientific writers have abandoned the doubts raised by Ehrenberg and others, and believe in the revivification of rotifers, tardigrades, etc., after complete and unlimited desiccation. His own experience with a colony of rotifers which he received by post in a few grains of dry, dusty powder, and almost immediately brought to life by watering it in a stage-tank, was suggestive, certainly, of wonderful powers of endurance. He narrates the history of this colony as follows:—

> "Since its establishment in 1867, it has received no new immigrants, but as it increased and multiplied, some of its members, in a dry state, have been removed to stock new tanks for my friends. It is generally kept in a cabinet, with other objects, and watered for examination when required, or, as a rule, once a month; so small a quantity of water dries up rapidly in summer; in a day sometimes. The longest time it has kept continuously dry is ten months; in winter, after watering, it has been frozen into a mass of ice; it has been heated on a brass mounting-table, with a spirit lamp very often, in order to melt the marine glue when a new cover has been required; it has been exposed dry to the sun in a photographer's glass room, all through a broiling summer; taken a sea voyage to the south of Spain, revived there and brought home again; taken to Ceylon; to India; revived on ship-board, to the astonishment of the passengers; brought home, and a few of the dry inhabitants immediately posted off again to a friend in Ceylon, who revived and has them still. As a final indignity and injury this much enduring family has been put into the receiver of an air-pump for twelve hours and thoroughly exhausted. This was almost too much for it, but still there is a little life in the tank."

Experimenting on this subject, he found that, while some could survive a short exposure to a heat of 200° (Fahr.), a thorough baking or boiling for two or three hours killed them all. Drying for a week in an exhausted receiver along with sulphuric acid was also fatal. He admits proof of revival after four years' torpor; though he failed in experiments extending over only from one to three years. Though nearly all authorities agree in the books as to the desiccation theory, yet many good observers privately doubt whether those that revive were really dried at all; and Mr. Davis is satisfied that the non-revivers are the dried ones, and those which revive do so because they were not desiccated. He has observed that the creatures constantly give off a slimy secretion; and in drying they contract into an ovoid form, and the gelatinous fluid dries over them into a thin hard shell which protects them from further drying. If isolated rotifers are dried upon a clean glass slide they seldom revive; because they crawl about until the last moment, and thus part with so much of their protective covering that they are finally dried up and destroyed.

Notwithstanding the first impression of some of the Fellows of the Society, that Mr. Davis' researches had been entirely anticipated by many continental authorities, the doctrine of the gelatinous envelope seems to be an entirely original as well as a very satisfactory settlement of a much disputed question.

ACTION OF POISONS ON THE BLOOD CORPUSCLES.—Dr. Osler read a paper before the Medical Microscopical Society, in London, giving the results of his experiments on the action of solutions of the sulphates of atropa and of physostegia upon the blood corpuscles. He hoped to show, in the corpuscles, the already demonstrated antagonism between these reagents, but reached an exactly opposite result, both solutions checking in a somewhat similar manner the amœboid movements of the white corpuscles, and both causing the red corpuscles to become irregular from involutions and cuppings of the surface. The reagents mixed produced the same changes as when separately applied. Solutions of curare were also mixed with blood, but produced no positive results.

LIMIT OF RESOLVING POWER. — How little we appreciate the extent to which the resolving power of our best objectives falls below the possibilities of their amplifying power, was well illustrated by the surprise of many microscopists, and the incredulity of some, when Nobert's 19th band, of 112,000 lines to the inch, was beautifully resolved by a power of scarcely over two hundred diameters; while, with absolutely faultless definition, the same lines ought to be visible under a much lower power than that. What we ought, theoretically, to be able to see with powers of from one to three thousand diameters, is computed in the following curious extract from one of Dr. Pigott's recent papers.

"With regard to these minute quantities [beading one hundred thousandth of an inch in diameter, etc.], and to remove doubts which may arise in some persons' minds as to the possibility of seeing such very minute linear quantities, I may say that a minute of arc corresponds to the breadth of the 334th part of an inch as seen at ten inches, which is at least four times as thick as a human hair at that distance. Now the one hundred thousandth of an inch under a power of 1,000 is precisely the same thing as a thousandth of an inch under a power of one, or seen naturally at ten inches. But we can see hairs much finer than this — say three times — therefore, with regard to arc, we can see with a power of 1,000 the $\frac{1}{3}$ of $\frac{1}{100000}$, *i.e.*, with a power of 3,000 about the millionth. To find the angle in seconds, $1'' = 0.000004848 = \frac{5}{1000000}$, nearly.

$$\left.\begin{array}{l}\text{The angle under a power of 3,000, at} \\ \quad\text{a distance of ten inches, is for a} \\ \quad\text{millionth of an inch. . . . .}\end{array}\right\} = \frac{3.000}{10 \times 1000000} = \frac{3}{10000}$$

Divide this by the value of one second and we get six seconds in the angle subtended by $\frac{1}{1000000}$ under a power of 3,000."

USE OF MICRO-PHOTOGRAPHS.—The experience of the late siege of Paris has given a permanent prominence to microphotography as a practically useful art. A French engineer now proposes to reduce messages photographically to microscopic size, and then blow them through a pneumatic tube under the straits of Dover to England, where they should be raised by photography to a legible size again. Thus the promptness of the telegraph would be approached, while its expensiveness, in the case of long messages, would be avoided.

STRUCTURE OF DIATOMS.—In stating Mr. Stodder's disbelief that the silicious matter in diatoms was always deposited in spherules, we omitted to explain that it was the processes, or so-called feet, of *E. Argus* which he considered structureless. Mr. Stodder also desires us to notice that he does not adopt Mr. Slack's term "ordinary diatoms;" that he has not believed the markings on all diatoms to be depressions, but that the dark spots seen by reflected light on *E. Argus* are so; and that he and Mr. Wells have not been associated in studying this subject. He also contributes the following remarks in regard to test objects and high powers.

"The histologists, vegetable and animal anatomists may say as they have said, 'What of it? Is it worth the time and labor required to determine whether the minute granule of one fifty thousandth of an inch is hexagonal or circular, a bead or a cavity?' Yes, gentlemen, it is, for so long as these questions are unsettled, so long must you be uncertain of the true interpretation of your own observations; so long as you do not use the best instruments and the highest powers, so long must you be ignorant of the undiscovered, uncertain whether you have found all that can be found. No better tests are yet known of the quality of microscope lenses than the diatoms and Nobert's lines. To know that you have obtained the best results in your own specialties you must know what your instruments can do on known objects; to 'increase knowledge' in your own departments, you must use the best instruments and the highest powers the skill of the optician can produce. Science cannot be much advanced by the use of lenses of twenty years ago."

METHODS OF STUDY IN INFUSORIA.—An abstract of an extremely suggestive paper relative to this subject is given under "Reviews" in this number of the NATURALIST.

CORRECTION TO NOTE ON APERTURE.—"Improved assumption" p. 567, line 1, should have been printed "unproved assumption."

NOTES.

THE Kansas Academy of Science held its sixth annual meeting at Lawrence, Kansas, on Sept 11 and 12. This Academy holds its annual meeting of two or three days duration in different places in the state. Papers are read on various subjects, and considerable work is done for the encouragement of science throughout Kansas. Quite a number of papers were read, and a special address was delivered which was anti-Darwinian in character. Among the papers falling in our sphere for notice, was one by Prof. F. H. Snow on "Injurious Insects," and one by Prof. B. F. Mudge on the "Discovery of Fossil Footprints in Osage County," of "middle permian" age. Several hundred tracks were collected and will be sent to Prof. Marsh at New Haven. Another paper by Prof. Mudge was on the "Mound Builders." The evidences of this ancient race in Kansas consisted in finding deposits of pottery, indicating ancient villages, but we do not note anything in the description of the remains that prove them to be those of mound builders any more than of Indians of more recent date. No mounds are mentioned, and, until the pottery found has been carefully compared with that unquestionably made by the mound builders and the Indians, the particular race whose remains are described must be left in doubt. The following is the most interesting part of the paper as reported:—

"But the most important locality seen by us in Kansas lies not